

## FISH AND FISHING IN THE INLE LAKE.

BY

N. ANNANDALE, D. SC., F.A.S.B.,

*Director, Zoological Survey of India.*

(With 3 plates.)

It has been my lot in the last ten years to visit many lakes, scattered over Asia from Japan to Palestine. I know of none so interesting to the naturalist and the student of human races as the Inle Lake in the Southern Shan States, which I had the good luck to investigate both in 1917 and in 1922. It lies in a hollow some three thousand feet above sea-level but bordered on either side by mountains fifteen hundred to two thousand feet higher. As in hilly country in other parts of Burma and south-eastern Assam, these mountains run almost due north and south. At the head of the valley there is an alluvial plain, evidently covered at no very distant period by the lake, while to the south the bordering mountains gradually dwindle and a stream flows down to Karen-ni, where, more than a hundred miles away, it disappears into the ground. That its water ultimately reaches the Salween there can be little doubt. The area of the lake varies with the seasons, but, roughly speaking, it is fourteen miles long, about four miles broad and of an irregular oval shape.

In the physiography of the lake two features are particularly striking, the clearness of the water and the floating islands that form a ring round the margin. Both these features give a peculiar beauty, unique in my experience, to the Inle Lake. The Loktak Lake in Manipur has the floating islands, less rich and less varied in vegetation but formed in the same way and of the same general appearance, but its waters are muddy and turbid.

Out in the middle of the lake, a mile and a half from any land, the State of Yawngwe maintains a bungalow for the use of visitors, supported on strong wooden posts and stoutly constructed of bamboo matting with wooden floors and beams and a thatched roof. Around and under this ideal retreat one can watch the fish and the beautiful and highly peculiar water-snails almost as in an aquarium, except that the point of view, natural to an air-breathing animal, is from above. In the mornings of early spring the surface is usually unruffled by the slightest breeze, the water is as clear as glass and the luxuriant growth of the submerged weed (*Najas minor*) provides a background and a floor unrivalled in graceful outlines and the beauty of its deep greens and browns. The house-posts themselves are veiled in a thin film of fixed vegetable and animal life, mostly in delicate tones of rusty tint.

Round and round the house swims the Inle Herring Barbel (*Barbus compressiformis*)\*, a graceful green-backed silvery fish only known from the Inle Lake. The smaller fish congregate in shoals and rush to the surface, some little distance beneath which they usually swim, when anything edible or otherwise is thrown into the water. If it be edible they await its descent for a few inches before attacking it. Everything that it is not too hard or too big they find edible, and they are very foul feeders. The larger fish of the same species, half a pound or rather more in weight, remain near the bottom and swim solitary. They are not attracted by what happens on the surface. From their large mouths and from their general structure and appearance, not

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\* The species was originally called *B. compressus* by Boulenger (*Ann. Mag. Nat. Hist.* (6) XII. p. 202, 1893) and the name was changed at the suggestion of the author to *B. steadmanensis* in 1918 (*Rec. Ind. Mus.* Vol. XIV, p. 47). In the meanwhile, however, Cockerell had called it *B. compressiformis* in a paper on the scales of fishes (*Bull. Bour. Fisher.* (Washington) XXXII, p. 133. 1913).



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*Characteristic Fish of the Inle Lake.*

- FIG. 1. —The Golden Sprat Barbel (*Barileus auropurpureus*, Annand). Slightly reduced.
- FIG. 2. —The Scaleless Minnowlet (*Sawbwa resplendens*, Annand). Twice natural size.
- FIG. 3. —The Crimson Minnowlet (*Microrasbora erythrom'eron*, Annand). Twice natural size.
- FIG. 4. —The Red-headed Minnowlet (*Microrasbora rubescens*, Annand). Twice natural size.
- FIG. 5. —Brownie's Loach (*Nemachielus brunneanus*, Annand). Twice natural size.



unlike that of small pike, they are probably both predaceous and voracious. Here and there single individuals of the Burmese Red-Finned Barbel (*Barbus sarana caudimarginatus*) may be seen, but apart from the Herring Barbel. With the young Herring Barbel, but not mixing with them, are still larger shoals of a smaller but more beautiful fish. Like the Assyrian host, its "cohorts are gleaming with purple and gold." Its sides are golden, its belly silver, and on its sides are numerous bands of deep purple-blue. This fish is unknown outside the Inle Lake-system. To it has been granted the name *Barilius auro-purpureus*. Its shoals have the habit of conglomerating from time to time into great spheres of living units a short distance below the surface. More of a surface fish than the Herring Barbel, the Golden Sprat Barbel, (as it may be called familiarly), feeds mainly on the small may-flies and caddis-flies and gnats (fortunately not mosquitoes) that rise from the lake in countless thousands every evening. It does not, however, ignore the attraction of the kitchen perched above its abode. In the heat of the day it goes to the bottom and may there be seen through the glassy water, eight feet down, tugging worms and insect-larvæ from the mud, a task for which its upwardly directed mouth is ill-adapted. It has to lie well over on its side to get a grip and often turns completely upside down in its struggles.

In the weeds skulks the Small Burmese Murrel (*Ophiocephalus harcourt butleri*), a voracious fish, and occasionally a Shan Carp (*Cyprinus carpio intha*), a fish which lives by "suction" from the mud of the bottom. In the He-Ho plain, which lies to the east of the Inle Lake and eight hundred feet higher but belongs to the same lake-system, the Carp (*Cyprinus carpio*) apparently reaches the western limits of its range in southern Asia. It is on the Shan plateau from He-Ho eastwards that the local race (*intha*) has become differentiated. In the weeds also live shoals of two other fish, both smaller than the English Minnow, both confined to the lake and its connected waters, both of gorgeous colouration and both belonging to small genera of limited range. Both are highly peculiar representatives of the carp family and both are remarkable not only for their small size and brilliant tints but also for their large eyes. This last feature is characteristic of the fish-fauna of the lake, in the clear water of which barbels and other tactile organs are rarely well-developed, while full advantage is taken of the high visibility in the strong development of organs of vision. The two little fish have been called *Saubwa resplendens* and *Microrasbora rubescens*. We may refer to them here as the Naked Minnowlet and the Red-headed Minnowlet. The former is unique in the carp family in that it has completely lost its scales. In the male the sides of the body are of an intense steely blue, while the head and the unpaired fins are of the most brilliant scarlet. The female, though more moderately garbed has a fine silvery sheen. The Red-headed Minnowlet possesses scales and is less abnormal in other respects. In both sexes the sides and lower parts of the head are orange-scarlet, while in the breeding male the whole body is suffused with the same bright hue. Neither of these fishes ever grow much more than an inch long.

Yet another little fish, even more abnormal than either of the Minnowlets, is also to be found, single and not in shoals, among the weeds under the bungalow, namely *Chaudhuria caudata*—a species so peculiar that it has been found necessary to propose a new family for its recognition. It is a little eel-like, or rather worm-like, creature, which does not grow much more than two and a half inches long. Small size, as well as large eyes and bright colours (neither of which *Chaudhuria* possesses), is characteristic generally of the fish of the lake.

Of the fish that live under and around the lake bungalow, I have left to the last the one that is most peculiar in habits. To it the Intha or "Sons of the Lake" have given a name which means the "fish that climbs the posts of houses". Its scientific name is *Discognathus* (or *Garra*) *gravelyi*. Both its Intha name and the generic name by which it is most generally known refer to obvious physical or

physiological peculiarities. Its mouth is situated on the lower surface of the head and immediately behind the mouth there is a large flattened disk by means of which it can adhere to any solid object. Most of the species of the genus\*, which are numerous in the hilly districts of India and Burma, inhabit rapid-running water and cling by means of their disk to rocks or stones in the current. Such a habitat does not afford the same facilities for watching the mode of life as does the lake-bungalow. One usually sees the fish swimming out in a clumsy manner from a mass of weeds, moving forward by abrupt and awkward jerks of its tail. It swims to one of the house-posts, to which it affixes itself by means of its disk. It spreads out both its paired fins flat against the post like a couple of fans on each side of its body. With its sharp upper jaw it then scrapes from the post the minute algae and Polyzoa which cover the wood. These are prevented from escaping by the deep fold of skin that forms a false upper lip, and are swallowed as they are set free. As it feeds the fish moves gradually up the post, thrusting itself upward by hardly perceptible movements of its tail.

These are the fish most abundant beneath the bungalow; but others are also to be seen occasionally: for instance, the two stickle-back eels (*Mastacembelus caudicellatus* and *M. oatesii*) peculiar to the Inle Lake system. Mr. Tate Regan† of the British Museum believes that it is to their family, or at any rate sub-order, *Chaudhuria* belongs, and doubtless he is right at any rate as to the sub-order. But as the most salient characters of the Stickle-back Eels are the spines on their backs and their peculiar fleshy snouts, neither of which characters *Chaudhuria* possesses, it is a remarkably isolated little fish.

I have mentioned twelve different kinds of fish as living beneath the Lake Bungalow, but this by no means exhausts the fish-fauna of the lake, from which no less than thirty-five or thirty-six species have been recorded. Of these, three are mud-loving forms of wide distribution in Eastern Asia, but found in the lake only among the floating islands at the edge. They are the two amphibious eels—*Monopterus albus* and *Amphipnous cuchia* and the Black Cat fish *Clarias batrachus*. The last is regarded as one of the best edible fish in the lake, but is a fowl feeder and the flesh is too soft to my taste. The Shans will not eat the eels, the flesh of which they believe to produce leprosy, probably on account of the livid mottled colour of their skins. The Intha, or true Sons of the Lake, have no such prejudice.

Among the islands at the edge, but near the surface under floating grass and water-weeds, a very different fish is found. It is even smaller than the two little fish that live amongst the thickets under the bungalow, hardly attaining the length of half an inch, but still more gorgeous in colouration. Its ground-colour, so to speak, is deep crimson and it bears on its sides a series of deep blue bars. At the base of its tail there is a large round eye-like black spot surrounded by a pale ring. The name of this fish is *Microrasbora erythromicron*. It is probably the smallest of the whole of the great carp family. For a trivial name I would suggest that of the Crimson Minnowlet.

The other species in the fish-fauna call for no very special notice, though several of them are peculiar to the lake. They belong to the carp family in a wide sense with the exception of the wide-ranging Freshwater Herring (*Notopterus notopterus*) and Striped Murrel (*Ophiocephalus striatus*), but three of them are small loaches of the family Cobitidae in a restricted sense. Further particulars may be found in my paper in Vol. XIV of the *Records of the Indian Museum*.

The method of fishing used in the Inle Lake are almost as diverse as the species of fish. The most striking to the visitor who is there in March are the use of floating islands as decoys for fish, and the manœuvres of the spearing parties, to be seen daily on the lake especially on the day before one of the local markets.

\* See Hora, *Rec. Ind. Mus.* XXII, pp. 633–687, pls. xxiv–xxvi (1921).

† Regan. *Ann. Mag. Nat. Hist.* (9) III, p. 198, (1919).



*Floating Islands of the Inle Lake.*

- FIG. 1.—The islands in their natural state (above).  
FIG. 2.— Islands used as gardens (in the middle).  
FIG. 3.—In the floating village of Kalle (below).



The floating islands, as already stated, surround the lake in a ring. They are formed entirely of growing and decaying vegetation. The first stage in their formation is the growing out, either from the shore or from an already formed island, of long shoots of various grasses and sedges which float on the surface. Among these shoots floating water-plants, such as the water-lettuce, duckweed, etc., get entangled and also much vegetable debris, including the topmost branches of the submerged plant *Najas* which are killed as the water sinks in the dry season, partly by dessication, partly by the heat of the sun, and partly by the luxuriant growth of algae of the family Rivulareaceae encouraged by this heat. Other shoots of similar plants and the floating masses of other weeds such as *Ammania rotundifolia* also get entangled. The peculiar chemical composition of the water transforms the dead parts of all this vegetation into a kind of peat, which soon forms a fertile soil held together on the surface by the roots of the growing plants. A rich flora springs up on this soil, including both ferns and numerous flowering plants such as orchids of two species and a peculiar *Utricularia* with yellow and purple flowers. This plant produces its flowers on long trailing stems which twist up the reeds to a height of several feet. A large shrub (*Cephalanthus occidentalis*) also grows on the floating islands and in places forms regular thickets amongst the tall grasses and sedges.

The floating islands are of primary importance in the economy of the Intha. Pieces of them can be cut off with iron spades and towed to any convenient spot. They are used for a great variety of purposes; as cemeteries it is said, and certainly for horticulture, in fisheries, and as break-waters to protect-houses built out on the lake. Our concern here is with them as fishing appliances. Any fisherman can, without cost to himself, cut off an island of suitable size, tie it to his boat by means of the reeds growing upon it and ropes made by twisting these reeds together, and tow it away anywhere on the lake; or if he is too occupied or too unskilled himself, he can hire somebody else to do all this for him, paying according to a recognized tariff based on the size of the island detached. Towards the latter end of March the process may be watched daily. A long strip of island, commonly of a hundred feet in length and five or six feet in width, is first cut off and tied to a boat, which is fastened at the side towards one end. The boatman, who is sometimes quite a small boy, laboriously poles the mass along until he reaches the appointed site. The island is then manœuvred until its long axis points directly across the lake and is fixed in this position by means of numerous long bamboo poles thrust through it down into the water and into the soft mud of the bottom. All of this is usually a day's work and sometimes the island-cutter—a recognised profession amongst the Intha—has to anchor his island temporarily for the night before he reaches its halting-place. Once in position he proceeds to cut off from one end of the island a piece about as long as broad. This he releases by pulling out the pole, or poles, thrust through it and tows it away to some distance in a straight line with the main piece. When he has towed it far enough he anchors it again with the pole and cuts off another piece of the same size, which he treats in the same way. The division and the towing-out of fragments of the original strip continues until there is a regular line of little islets extending out across the lake at regular intervals for a distance of several hundred yards.

Each of these islands is a trap, or rather a decoy, for fish. The main breeding-season in the lake begins just about the time that the islets are floated out and for most freshwater fish in tropical Asia the one essential at spawning time is cover and a suitable nidus. For these reasons the fish are attracted to the shade of the islets and are there caught at night by means of dip-nets and various other kinds of nets.



An even more peculiar method of fishing is the use of the spear, either alone or in company, either by day or by night. The Intha fish-spear is of two kinds. One has two prongs of iron, each with a single barb on its inner side. The two prongs are inserted in a mass of resin at the end of a bamboo. This kind of spear is only used for catching eels in the mud. The more popular kind has five similar, but finer, prongs cast in one piece with a corkscrew spike at the base. This spike is inserted into the stem of a long reed and neatly bound in position. The spear is used for catching all kinds of fish, especially the true Carp, which is the most abundant fish in the Intha markets, and the Herring Barbel. The spear is always used from a boat, and the Intha are extremely skilful in its manipulation.

Their boats are long and narrow, bifurcate and slightly turned up at either end. They are formed of stout planks of wood neatly fitted together and covered with black varnish in such a way as to give the impression of being carved out of a single log. They are flat-bottomed but very easily worked, answering to the slightest turn of the paddle. The Intha have a peculiar method of rowing by means of which they are said, in their own boats, to excel all other Burmese rowers in speed. They are "leg-rowers": that is to say, they row standing with one leg twisted round the paddle and use the leg in working, the oar as well as one arm. They can actually row in this way with one arm and one leg, standing on the other leg, and spear fish with the other arm. In this extraordinary manœuvre they seem to be quite ambidextrous as well as being able to use either leg indiscriminately.

In the use of the spear they are equally ambidextrous. Often a man or a boy goes out to spear fish alone. In order to prevent the boat turning round in an inconvenient manner while he is executing the manœuvre already described he hangs over the end of the boat that happens to be hindermost at the time—for the two ends are alike—a piece of rope to either end of which a small flat plank is attached. The string is just long enough to allow the two planks to hang in the water. They are very efficient in giving the boat stability. Sometimes the fish-spearer trusts merely to his own skill. He stirs up the weeds with a long bamboo pole and spears the fish as they come out, or waits for them over a clear space in the submerged thickets. Often he uses a large conical structure made of reeds sufficiently long to reach the bottom of the lake. This he inserts over a likely mass of weeds or at a place where he has seen a fish take shelter. In the narrow end of the cone, which remains uppermost, there is a small hole and through this hole he jabs down his spear until he hits the fish or decides that he has not succeeded in enclosing one.

Frequently a number of men combine together in spearing parties. They surround a suitable weedy area with a net the lower end of which is weighted and rests on the bottom while the upper end, to which floats are attached, lies some little distance below the surface of the water. The fishermen in their canoes remain inside the space enclosed by the net and alternately hit the surface with their paddles to frighten the fish and thrust at any they see. They know that the natural tendency of those fish which haunt the submerged thickets is to dive downwards and that individuals which escape their spears will swim along or near the bottom and entangle themselves in the net instead of making their way over the top. The fish caught most commonly in this way is the Herring Barbel, while the one particularly sought with the aid of the cone of reeds is the true Carp.

The most profitable method of spearing, however, is to go out at night with a small fire or a lamp at the front end of the boat which both attracts the fish and lights up the water. Sometimes single boats go out for the purpose, at others several advance together in a line. For every method of fishing the fisherman has to pay a small monthly license to the State. That for spearing at night with a light is the most expensive of all, costing Re. 1 a month.



*Boating and Fishing on the Inle Lake.*

FIG. 1.—Inthas leg-rowing (above).

FIG. 2.—Inthas making a fishing enclosure for the capture of *Crossocheilus latia* (in the middle).

FIG. 3.—Boats at the edge of the Lake on market day (below).



Numerous other methods of fishing are also adopted and most of the different kinds of nets and traps in common use throughout the Indian Empire are known to the Intha. I shall only mention two more methods which seem to me to be characteristic. The first is that of making large enclosures for the special capture of the fish *Crossocheilus latia*, a species usually found in running water, but not uncommon in the lake. The enclosure, which often surrounds a very large area, is made of masses of water-weed (*Najas*) dried and pegged down with bamboo poles to form a surrounding wall in the water and reaching up to the surface. Conical traps made of weeds are fixed in this wall. The fishermen take their boats into the enclosure and paddle about, striking the water with their paddles and stirring up the weeds with bamboo poles. At the end of the enclosure towards which the boats move, nets are fixed up in the air on poles to a considerable height. As the fish are driven out from the weeds many of them make their way into the traps, while others, attempting to jump over the wall, land themselves in the aerial nets.

The last method of fishing that I shall attempt to describe is the use of what may be called the weed-trawl. This is a bag-shaped net fixed in a bamboo frame with an almost triangular outline but with the top rounded instead of pointed. The broader end is strengthened by a bamboo running across the side-pieces. Two boats and three men are necessary for the use of this net. The two boats remain at first a few yards apart. In one of them there is a single fisherman; in the other, two. The single fisherman plunges the trawl downwards into the water among the weeds, holding it by the upper end. The two men in the other boat then pull it towards them by means of a couple of ropes fixed to the sides near the lower end. They thus pull up the lower end obliquely through the weeds capturing numerous stickle-back eels, carp and other fish in the mass of vegetation they detach.

The Intha are versatile folk. They are not only fishermen and agriculturists but also keen traders and skilled weavers of silk and cotton. Perhaps their most characteristic means of livelihood is the trade they conduct in dried whitebait and dried prawns. In both cases the animals which compose the product are of extremely small size. The fish belong mostly to such genera as *Sawbwa*, *Microrasbora*, *Nemachilus* and *Lepidocephalus*. In other words they are fish which never attain the length of more than a few inches. Some years ago it was proposed to suppress the industry as being destructive to immature fish. After careful examination of samples from several of the Intha bazaars I was able to assure the authorities that in none of these samples was the proportion of fish capable of growing to a reasonable size more than 5 per cent. and that in a very large proportion such fish were completely absent. The trade was not suppressed, and the product is still carried by coolies and on pack-oxen and mules as far as the Siamese frontier over three hundred miles away and up through the He-Ho gorge (by coolies only) to the railhead at He-Ho.

The dried prawns, which are not mixed with the fish in the bazaars, consist of two species of the genus *Caridina* \* and are even smaller than the fish. Both fish and prawns are dried in the sun on mats. They have no bad smell when of good quality and form a palatable condiment for curry when fried with onions and salt and pepper.

The Intha claim to be Burmese not Shans and to have come at some not very remote period from Tavoy. Authorities say that this legendary origin is confirmed by their language, which is a dialect of Burmese akin to Talaung. They dress like the Shans however, the men in baggy trousers and a short jacket and a loose turban, the women with a long simple skirt in place of the trousers, but also with the turban. They are sturdily built and taller than the Burmese properly so-called. Their faces are broader, their features generally of coarser

(\*) Kemp, *Rec. Ind. Mus.* XIV, p. 96 (1918).

type. Their houses are like those of the Shans but are often built on bamboo poles in the water.

As in other parts of Burma a bazaar is held in each village once every five days. No two villages within easy walking distance have the same market day, but in any one small district there is a market that any one can attend somewhere practically every day of the week. The biggest market in the State of Yawnghwe is held at a large village called Nan-pan, which is situated just south of the lake on the river that runs down to Karen-ni. Two thousand boats are said to come to this market on a full market as well as numerous pack-oxen from the eastern part of the State, while the hill tribes for many miles round come down on foot.

The people of Nan-pan are famous for their silks, for their iron-work, their gongs and their lacquer tables. Their blacksmiths are said to be the most skilled in the country and provide a great deal of the gilded iron foliage with which the thrones of the images of Buddha in the temples of Yawnghwe are decorated. A few men in this village are still able to make the fine boxes in niello work in which Intha elegants carry the lime for their betel-chewing. Very beautiful little tables, or rather low stands for holding food-dishes, are here made of bamboo basket-work covered with red and black lacquer on a wooden stand. They are used particularly by the monks and numbers of them are to be seen in any of the numerous monasteries that stud the shores of the lake.

But, in spite of all these industries and arts, the Intha are essentially simple fisher-folk, and it is to the lake and its fauna they owe the fact that they are in a position to indulge in such luxuries as silk trousers and lacquer tables. Even their fishing-nets are sometimes made of silk though the crude material is brought overland from China many hundred miles away.